The Monthly Evening Sky Map

A SCIENTIFIC JOURNAL AND EDUCATIONAL GUIDE IN ASTRONOMY FOR THE AMATEUR

Founded in 1905 by Leon Barritt

ALSO A STAR, CONSTELLATION AND PLANET FINDER MAP ARRANGED FOR THE CURRENT MONTHS - MORNING AND EVENING - AND PRACTICAL ANYWHERE IN THE WORLD

PUBLISHED QUARTERLY

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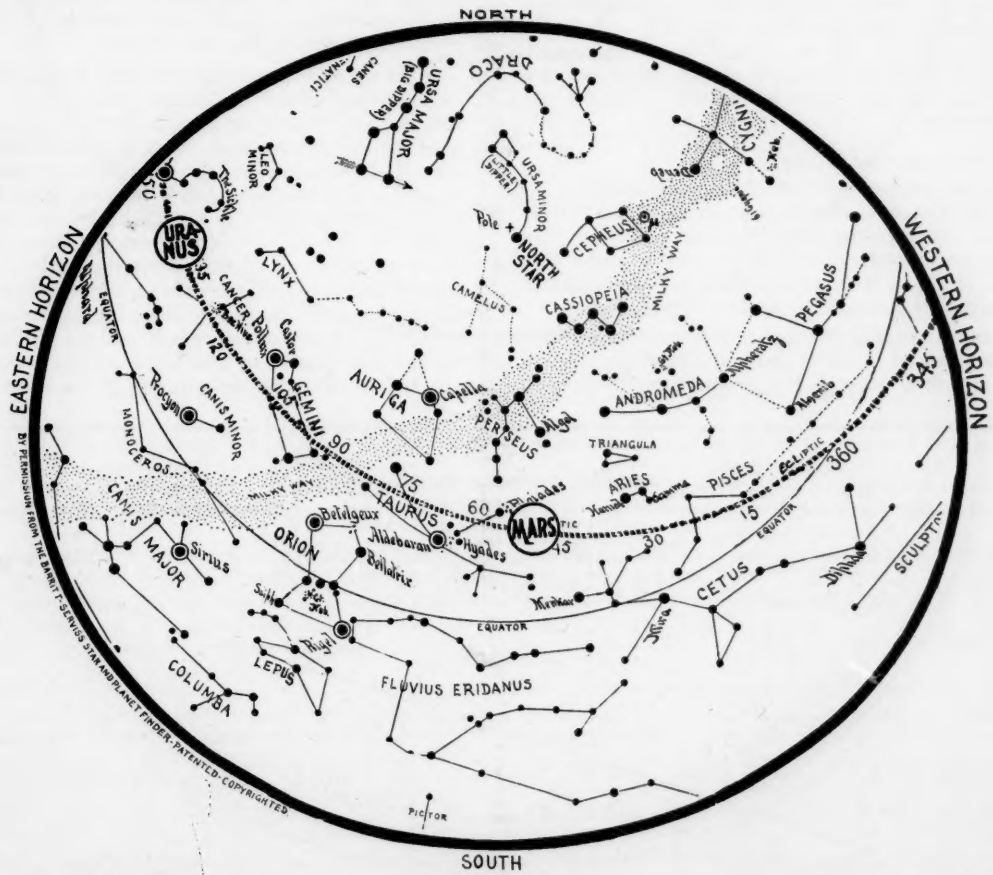
EVENING SKY MAP FOR JANUARY



AT 9:00 P.M., JAN 1 **8:00 P.M., JAN 15** **7:00 P.M., JAN. 31**

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper.

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

XUM

STANDARD TIME AND TIME ZONES IN CANADA

By C. C. Smith

Revised by M. M. Thomson — *Dominion Observatory, Ottawa, Ontario*

Introduction

Many questions on matters relating to standard time are referred to the Dominion Observatory. This publication is a compilation of the answers to those questions that are most frequently asked.

No map showing the positions of the time zones in Canada has previously been available. The explanation of why the times of watches have to be changed in travelling east or west will, it is hoped, prove sufficiently descriptive and definite. The chart of time zones of the world has for some time been in considerable demand.

The faster means of transportation and communication made possible in recent years by the aeroplane, the automobile, the radio, and wireless telegraphy, together with the greater interest thus developed in affairs in distant places, have made necessary a much more general knowledge of corresponding times and related questions.

To the officers of different legal departments and to others who have kindly furnished replies to questions, the writer wishes to express due appreciation. Acknowledgment is also made of the use of material from the national ephemerides. In the preparation of the material a very considerable part has been taken by Miss K. Nevins of the observatory staff.

Introduction to Revised Edition

Since the original publication of this pamphlet by the late Mr. Smith, many changes have occurred. Newfoundland has joined confederation to become the tenth Canadian province; provincial legislation has in some instances been modified; methods of communication and transportation have brought all parts of the world closer together.

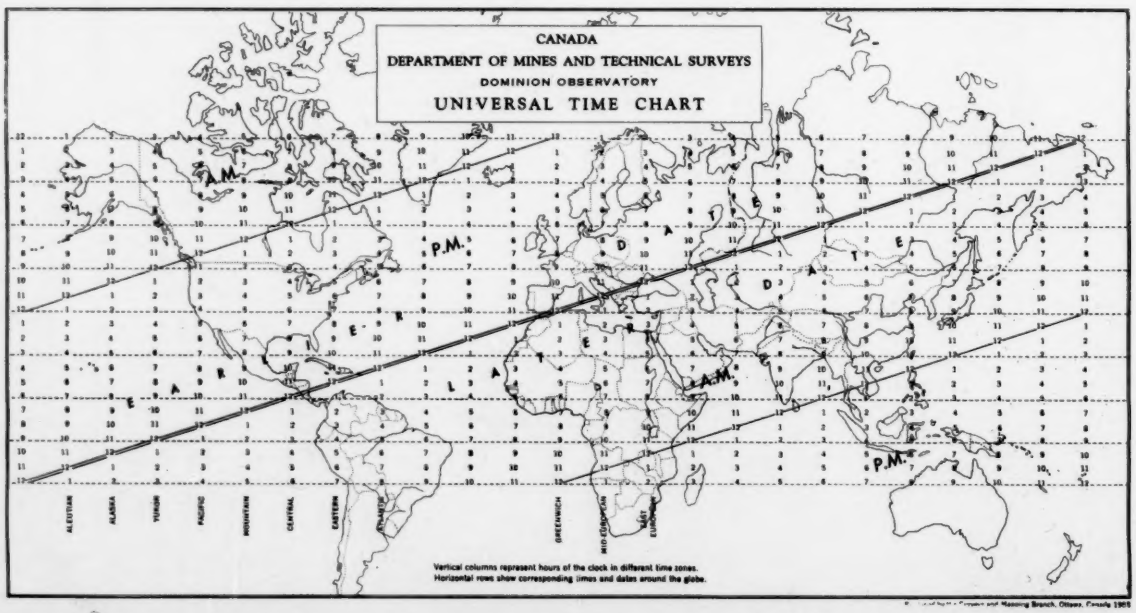
Improved methods of observing the time, together with the development of quartz crystal and atomic clocks, have resulted in a revaluation of the unit of time, the second. Hence some sentences in the original publication have been changed and new portions added.

Again thankful acknowledgment is made to the officers of different legal departments for assistance; to the officers of the national almanac offices for the use of information in the ephemerides; and to Mrs. B. Crawford and other members of the observatory staff for assistance in preparing the manuscript.

The Unit of Time—The Day

What time is, of course, nobody knows; one man's guess is as good as another's. Fortunately this lack of a satisfactory definition is for most purposes no great handicap; all that is necessary it to be able to measure time. How many days before this did that event happen—or how many days after? These are, for the most part the only questions concerning time that have to be answered, the former affording the time order for writing the history of the things that are past, the latter assisting in planning or predicting the things that are to come.

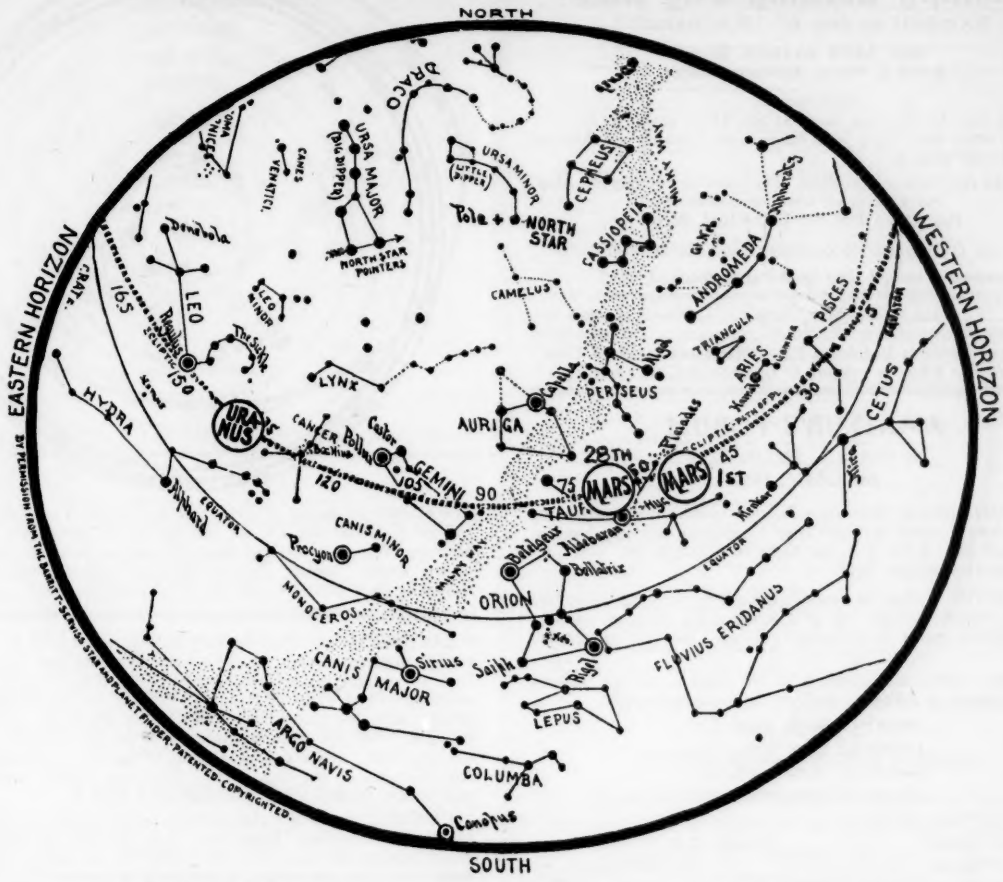
For the measurement of time there was supplied, when the earth was created, an almost perfect clock. The earth was sent into space spinning around on its axis and it has since continued to travel in an orbit, almost circular, about the sun. The time needed for one rotation of the earth on its axis, a day, is a pratical unit of time. Since the easiest way to count the days is to note each time that the rotation brings the sun overhead, a solar day has always been used as the ordinary unit of time. Since the earth in its yearly journey around the sun moves in an orbit which is not quite circular, the days obtained by observing successive passages of the sun are of unequal length, and the day adopted as the practical measure of time is the average or mean solar day. It is evident that the rotations of the earth could be



UNIVERSAL TIME CHART enables the user to determine the time for any point on the earth's surface. See Page 8 for details..

XUM

EVENING SKY MAP FOR FEBRUARY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WESTERN HORIZON
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(BIG DIPPER)
URSA MINOR
(LITTLE DIPPER)
NORTH STAR
NORTH STAR POINTERS
CEPHEUS
CASSIOPEIA
MILKY WAY
ANDROMEDA
CAMELUS
LEO
LEO MINOR
Denebola
Regulus
The Sickle
LYNX
PERSEUS
AURIGA
Capella
TRIANGULA
ARIES
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Alnilam
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Algol
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Beta Arietis
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Delta Arietis
Epsilon Arietis
Zeta Arietis
Eta Arietis
Theta Arietis
Iota Arietis

The

Monthly Evening Sky Map

FOUNDED IN 1905 BY LEON BARRITT

MRS. LEON BARRITT, Editor
Irving L. Meyer, Managing Editor

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All time is expressed in Eastern (75th Meridian) Standard Time. Add five hours to convert to Greenwich Civil Time.

AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.
JANUARY, 1959

THE SUN: just past the winter *Solstice,* is close to the beginning of its northward climb. It moves from Sagittarius, into Capricornus. On the first day of the year, the earth is closest to the Sun, at a distance of 91.3 million miles.

THE MOON: makes its closest approach to the earth *(perigee)* twice this month, on the 5th at 228,000 miles distance, and the 31st at 230,000 miles. It is farthest *(apogee)* the 17th at 251,000 distance.

Libration: maximum exposure of the regions on the Moon's limbs take place as follows:

January 9 South limb, 6.5°
January 12 West limb, 5.8°
January 23 North limb, 6.5°
January 24 East limb, .5.0°

The Moon's Phases (E.S.T.):

Last Quarter	January 2 at 5:50 am
New Moon	9 at 12:34 am
First Quarter	16 at 4:26 pm
Full Moon	24 at 2:32 pm
Last Quarter	31 at 2:06 pm

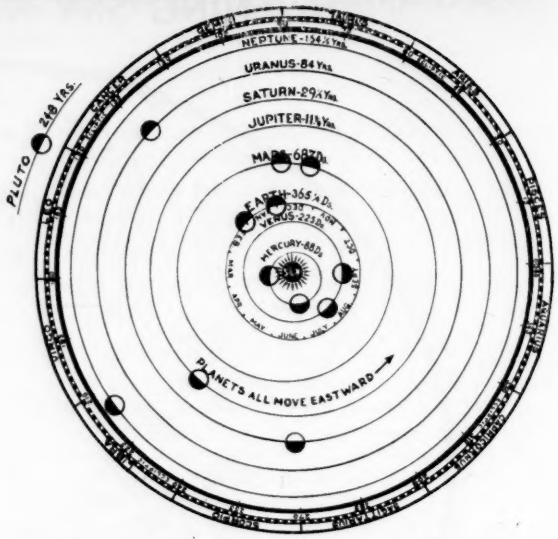
MERCURY: the "Speed Merchant", races eastward through Ophiuchus, Sagittarius, to the boundary of Capricornus. It is in the morning sky, close to elongation on the 1st and therefor observable close to the eastern horizon as dawn breaks. Magnitude is -0.2 (very bright), and the small disc is gibbous in the telescope. The period of observability is limited to about the first week of January; thereafter it closes in on the Sun and cannot be seen in the bright sky when it rises. Distance the 1st is 97 million miles, increasing to 130 million miles the 31st.

VENUS: in the evening sky, precedes the Sun on a north-east march along the ecliptic. Though still close to the Sun, this planet is so bright that it is readily observable in the strong evening twilight, close to the western horizon. Greatest elongation is still for off, not occurring until June. Distance from the earth is decreasing; from 154 million miles the 1st, to 147 million miles the 31st.

MARS: still a bright object in the evening sky, it is beginning to move more and more rapidly eastwardly, though still in the neighborhood of the Pleiades, in Taurus. Its distance from the earth is increasing rapidly—from 68 million miles the 1st, to 93 million miles the 31st. At the same time, magnitude drops from -0.6 to 0.2, diameter decreases from 13" to 9", and the area illuminated drops slightly below 90% by month-end, showing as distinctly gibbous in the telescope. A pretty powerful telescope is now needed to show much detail on the planet's face.

JUPITER: is in Libra all month, far south of the equator. It rises well after midnight, but as dawn breaks, is pretty well placed for observation. This is a brilliant planet (magnitude -1.4) and very big. Despite its great distance of 545 million miles on the 15th, its apparent equatorial diameter is 33". Binoculars are sufficient to show the flattening of the disc, and the four bright satellites (see charts of their motions, elsewhere in this issue), but a telescope will reveal band markings on the disc itself.

HELIOCENTRIC POSITIONS OF THE PLANETS, JANUARY



The planets are shown in their respective orbits. Two positions, one for the first, and one for the last day of the month are given for Mercury, Venus, Earth, and Mars. The arrow indicates the last day of the month. Jupiter, Saturn, Uranus, Neptune, and Pluto are shown in their mean position for the current month.

SATURN: in the morning sky, in Sagittarius, can be observed readily toward the close of the month, but only just before dawn. It is in conjunction with Mercury shortly before it rises on the morning of the 11th, and the two will be an interesting pair to anyone with binoculars who cares to try for them in the dawn twilight. They are close together, with Mercury a little brighter. On the 15th, distance is 1018 million miles, magnitude is 0.7, and diameter of the ring is 34". The ring system, incidently, is still widely opened toward the earth.

URANUS: rises right after sunset, from a point in Cancer close to the Leo boundary. Magnitude, from Muller's fromula, is 5.7, which means the planet is just visible to the naked eye. If the stars in the area are plotted (perferably as seen in binoculars) the motion of Uranus, now retrograde, will distinguish it readily. Refer to the January Mercator Projection for a detailed chart of the path of this planet. Distance the 15th is 1628 million miles.

NEPTUNE: this planet's slow motion on its 165 year journey around the Sun keeps it in each constellation many years, but on the 1st of the month it is almost exactly on the I. A. U. boundary of Libra, crossing into that constellation later in the month. Neptune is beyond the reach of the naked eye (magnitude 7.8 on the 15th) but can be seen with good binoculars. Its disc can be seen with a telescopic magnification of 100 diameters, but it is dull and uninteresting. In the morning sky, it rises around midnight. Distance the middle of the month is 2836 million miles.

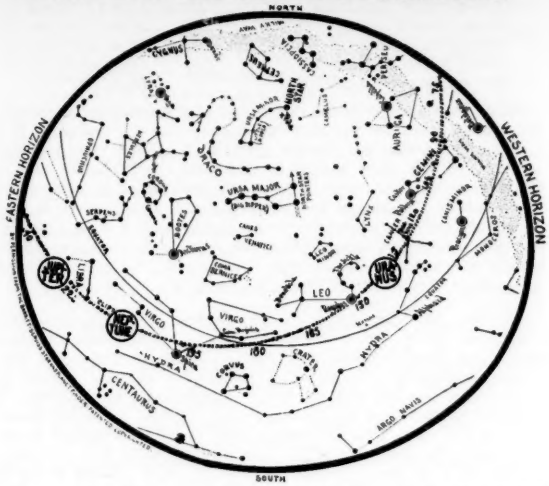
ASTRONOMICAL CALENDAR

Eastern Standard Time

JANUARY, 1959

January	1— 8:— pm	Earth in perihelion
	2—12:— am	Venus in perihelion
	3—10:43 am	Minimum of Algol
	4—12:58 am	Conjunction, Neptune and Moon; Neptune north 0° 9'
	5— 6:24 am	Conjunction, Jupiter and Moon; Jupiter south 2° 5'
	6— 7:32 am	Minimum of Algol
	7—10:43 am	Conjunction, Mercury and Moon; Mercury south 3° 58'
	7— 6:18 pm	Conjunction, Saturn and Moon; Saturn south 3° 50'
	9— 4:21 am	Minimum of Algol
	10— 6:21 am	Conjunction, Venus and Moon; Venus south 6° 20'
	10—11:— pm	Conjunction, Mercury and Saturn; Mercury south 0° 45'
	12— 1:10 am	Minimum of Algol
	12—NOON	Mercury in descending node

MORNING SKY MAP FOR JANUARY



At 5:00 A.M., JAN. 1; 4:00 A.M., JAN. 15; 3:00 A.M:, JAN: 31

14—	9:59 pm	Minimum of Algol
17—	6:48 pm	Minimum of Algol
18—	5:38 pm	Conjunction, Mars and Moon; Mars north 4° 57'
20—	3:37 pm	Minimum of Algol
22—	7:— pm	Mercury in aphelion
23—	12:26 pm	Minimum of Algol
24—	1:— pm	Venus greatest heliocentric latitude south
25—	12:11 pm	Conjunction, Uranus and Moon; Uranus north 5° 17'
26—	9:15 am	Minimum of Algol
27—	Noon	Quadrature, Neptune and Sun
29—	6:04 am	Minimum of Algol
31—	6:51 am	Conjunction, Neptune and Moon; Neptune south 0° 7'

AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

FEBRUARY, 1959

THE SUN: moving at a constantly accelerating pace toward the northern hemisphere, leaves Capricornus and enters Aquarius. The earth's distance increases from 91.5 million miles the 1st, to 92.0 million miles the 28th.

THE MOON: is farthest from the earth the 14th at 251,000 miles, and is closest the 26th at 227,000 miles.

Libration: maximum exposure of the regions on the Moon's limbs take place as follows:

February 5	South limb,	6.6°
February 8	West limb,	5.0°
February 20	North limb,	6.7°
February 20	East limb,	5.9°

The Moon's Phases (E.S.T.):

New Moon	February 7 at 2:22 pm
First Quarter	15 at 2:20 pm
Full Moon	23 at 3:54 am

MERCURY: not observable all month. It is in the morning sky until conjunction with the Sun on the 14th, thereupon entering the evening sky. It moves through Capricornus, well into Aquarius. Maximum geocentric distance, the 6th, is 131 million miles.

VENUS: is in the evening sky, crossing the equator as it moves from Aquarius into Pisces. It is now far enough from the Sun that it is an easy subject in the evening twilight sky, shortly after sunset. During the month magnitude increases slightly, from -3.3 to -3.4; distance decreases from 146 to 137 million miles; and the area of the disc illuminated as seen from the earth decreases from 95% to 90%.

MARS: is now starting to move eastwardly at a rapid pace. In In Taurus all month, in the evening sky, it will be a few degrees north of Aldebaran at month-end, and remarkably similar to that star, both in brightness (Mars a shade brighter) and color. Rapidly increasing distance (from 94 to 119 million miles during February) is both dimming Mars' lustre and diminishing the apparent size of its disc. It is now so far away only a large telescope can reveal much detail on the planet's face.

SATELLITES OF JUPITER

JANUARY

Day	West										East
0			3•	2•		○	·1				·4	
1				·3	·1	○	·2				4•	
2						○	·31•	2•			4•	
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4	○1•				·2	○		4•	3•			
5						4• ○	·1	3•	·2			
6				4•	3•	1• ○	2•					
7			4•	3•	2•	○	·1					
8		4•		·3	·1	○						·2●
9		4•				○	1•	2•				·3●
10		·4				½ ○			·3			
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12				·4		○	⅔					·1●
13					3•	1• ·4 ○	2•					
14			3•	2•		○	·1	·4				
15				·3	1•	·2 ○				·4		
16						○	1•	·2			·4	·3●
17					·1	½ ○		·3			·4	
18					·2	○	1•			·3	4•	
19						○	·2	3•			4•	·1●
20						·3 ·1 ○		2•		4•		
21				3•		2• ○	·14•					
22				·3		1• ·2 ·4 ○						
23				4•		·3 ○		·1	·2			
24			4•			·1 ½ ○			·3			
25		4•			·2	○	1•			·3		
26		·4				·1 ○	·2		3•			
27	○1·○3•		·4			○		2•				
28				·4	3•	2• ○	·1					
29				·3	·4	·2 1• ○						
30					·3	○	·4	·1	·2			
31					1•	○	2•	·3	·4			

Appearance of Jupiter and its satellites at 6:45 A. M., E. S. T. as seen in an inverting telescope

Jupiter is represented by the disc in the center of the chart, and each satellite by a dot and its appropriate number. The direction of the satellite's motion is from the dot toward the numeral. The numeral and light disc at the left margin of the chart indicates a satellite in transit across Jupiter's disc; the numeral and dark disc at the right margin indicates a satellite which is invisible because it is being eclipsed or occulted by Jupiter. This chart must be held upside down if binoculars, opera glasses, or an erecting type telescope is used.

JUPITER: is north-west of Antares, In Scorpio, all month. It is a morning star, rising after midnight. Though opposition is still several months away, the planet is nevertheless bright and interesting. Average magnitude during February is -1.6, and equatorial diameter 37". That the planet is larger in diameter through the equator than through the poles is readily perceptible in small telescopes. The same equipment will show the reddish bands across the disc. Taken together with the four bright satellites Jupiter is a truly entertaining spectacle. Distance the 15th is 501 million miles.

SATURN: in another morning "star", in Sagittarius. It now rises sufficiently before the Sun to be in good observing position late in the night. Magnitude is 0.8, and the diameter of the ring is 35". The diameter of the planet itself is about 16". Again we have a planet so big that small equipment will reveal much detail. Distance the 15th is 990 million miles.

URANUS: comes to opposition the 3rd, in Cancer. However, this planet though great in size, is so remote that it is barely visible to the unaided eye. Magnitude is 5.7, which is only .2 magnitude brighter than it will be in August, when farthest from earth. A power of 50 diameters will reveal its tiny, 4" diameter disc. Detail is difficult to see even with the great telescopes. Minimum distance from the earth at this opposition occurs the 5th at 1621 million miles.

XUM

NEPTUNE: also in the morning sky, rises before midnight from a point in Libra just over the Virgo boundary. At magnitude 8 it is a pretty dull object and fairly difficult to detect from among the many similar-looking stars. Distance the 15th is exactly 30 astronomical units, or 2787 million miles.

PLUTO: high in the northern heavens, in Leo, and far north of the ecliptic, this planet comes to opposition the 22nd. At that time its closest approach to the earth for the year will be made, at 3072 million miles. A 14th magnitude planet, it can only be seen with pretty powerful telescopes. Though uninteresting from a visual standpoint, there are several "firsts" Pluto can claim. It has the most eccentric orbit of any of the major planets, and also the orbit most inclined to the ecliptic. As a result, when it is in perihelion in 1989 it will be just about astride the Serpens-Libra boundary, and only a degree or two south of the equator. Furthermore, it will then be closer to the Sun than Neptune can ever come even though Pluto averages some 870 million miles further from the Sun than Neptune.

ASTRONOMICAL CALENDAR

Eastern Standard Time

FEBRUARY, 1959

February	1— 2:53 am	Minimum of Algol
	1— 7:32 pm	Conjunction, Jupiter and Moon; Jupiter south 2° 34'
	3— 4:— pm	Opposition, Uranus and Sun
	3—11:42 pm	Minimum of Algol
	4— 7:13 am	Conjunction, Saturn and Moon; Saturn south 4° 2'
	6— 8:30 pm	Minimum of Algol
	7— 8:32 am	Conjunction, Mercury and Moon; Mercury south 6° 44'
	8—12:— am	Neptune stationary in Right Ascension
	9— 1:01 pm	Conjunction, Venus and Moon; Venus south 4° 24'
	9— 5:19 pm	Minimum of Algol
	12— 2:— am	Mercury greatest heliocentric latitude south
	12— 2:08 pm	Minimum of Algol
	14—12:— am	Superior conjunction, Mercury and Sun; Mercury south 2° 1'
	15—10:57 am	Minimum of Algol
	16—12:19 am	Conjunction, Mars and Moon; Mars north 5° 53'
	18— 7:46 am	Minimum of Algol
	20— 2:— am	Quadrature, Jupiter and Sun
	21— 4:35 am	Minimum of Algol
	21— 7:21 pm	Conjunction, Uranus and Moon; Uranus north 5° 21'
	22— 3:— am	Opposition, Pluto and Sun
	24— 1:24 am	Minimum of Algol
	26— 3:— pm	Quadrature, Mars and Sun
	26—10:13 pm	Minimum of Algol
	27—12:29 pm	Conjunction, Neptune and Moon; Neptune south 0° 17'

AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

MARCH, 1959

THE SUN: continues to climb northward, crossing the equator into the northern hemisphere during the month. Distance continues to increase; from 92.0 million miles the 1st, to 92.8 million miles the 31st.

THE MOON: is at apogee the 14th at a distance of 252,000 miles, and is at perigee the 26th at a distance of 224,000 miles.

Libration: maximum exposure of the regions on the Moon's limbs take place as follows:

March 5 South limb, 6.7°
March 6 West limb, 5.3°
March 19 North limb, 6.8°
March 20 East limb, 7.0°

The Moon's Phases (E.S.T.):

Last Quarter	March 1 at 9:54 pm
New Moon	9 at 5:51 am
First Quarter	17 at 10:10 am
Full Moon	24 at 3:02 pm
Last Quarter	31 at 6:06 am

There is a partial eclipse of the Moon on the 24th, but not visible in the United States. This eclipse can be seen generally from Europe, Asia, Africa, and portions of Australia and Antarctica. At maximum, only 26.9% of the Moon's diameter is obscured.

CIRCUMSTANCES OF THE ECLIPSE

Moon enters penumbra	March 24 at 12:56 pm
Moon enters umbra	24 at 2:16 pm
Middle of eclipse	24 at 3:11 pm
Moon leaves umbra	24 at 4:07 pm
Moon leaves penumbra	24 at 5:27 pm

MERCURY: moves about in the Aquarius-Pisces region, crossing the equator from the southern hemisphere into the northern. It is in the evening sky, and reaches greatest elongation from the Sun, 18° 20', on the 12th. It will be observable in the early evening sky, low in the west and close to the horizon as twilight fades. Magnitude is -0.1, and in the telescope it will look crescent shaped. Remember that this planet moves so rapidly that it is only observable for a few days around the 12th; thereafter it moves rapidly toward conjunction with the Sun. Distance the 1st is 112 million miles, decreasing to 55 million miles the 31st.

VENUS: now the queen of the evening sky, it moves from Pisces into Aries, and forms an interesting, though distant, companion for Mars. These two planets dominate the night sky. Venus, magnitude -3.4, is the most brilliant planetary object in the heavens, the Sun and the Moon excepted. In the telescope, it is a curious object—a 12" diameter disc, *gibbous* (like the Moon between Full and Quarter phase), and so overpoweringly bright as to show no detail whatever. This lack of detail has prevented determination of rotationperiod to this day. It is coming closer to the earth every day; distance decreasing from 136 million miles the 1st, to 122 million miles the 31st.

MARS: still a bright planet in the evening sky, it sets from Taurus at about midnight. Its rapid motion toward the east delays its capture by the Sun for many months. Much of the brilliance of last fall has now been lost, and it shines with about the brightness of a standard first magnitude star. Diameter averages only 7" —a small disc in any telescope. Distance the 1st is 120 million miles, increasing to 147 million miles the end of the month.

JUPITER: rises before midnight, in Scorpio. This bright giant, the greatest of the planets, is a great sight even in binoculars. Four big satellites (see charts of their positions elsewhere in this issue) accompany the primary, and are easy to see with any optical help. A moderate sized telescope will show up the eclipses, occultations, transits, and shadow transits of these bodies. All in all, Jupiter is the best observing material for the amateur. Distance the 15th is 460 million miles.

SATURN: in the morning sky, in Sagittarius, rises at about midnight. Bright and interesting, it is unique in having a ring system about it. Together with several bright satellites (Titan can be seen with moderate telescopes), it ranks with Jupiter as an annual attraction. Distance the 15th is 951 million miles.

URANUS: in Cancer, can be seen without optical aid on a clear, moonless night. Coming upon this planet with 100 diameters on a 12" telescope, as the writer has done many times, the bright, greenish disc distinguishes this planet from the stars at once. Magnitude is 5.7, apparent diameter 3.9". Distance the 15th is 1642 million miles.

NEPTUNE: is in the morning sky, beginning the month in Libra, then crossing back into Virgo, where it will remain until October. Faint and not too interesting, this planet can only be seen with optical aid. Diameter of 2½" can be made out with a moderate powered telescope. Distance the 15th is 2749 million miles.

ASTRONOMICAL CALENDAR

Eastern Standard Time

MARCH, 1959

March	1— 5:08 am	Conjunction, Jupiter and Moon; Jupiter south 2° 52'
	1— 7:02 pm	Minimum of Algol
	3— 3:— am	Mercury in ascending node
	3— 5:05 pm	Conjunction, Saturn and Moon; Saturn south 4° 14'
	4— 3:51 pm	Minimum of Algol
	7—12:40 pm	Minimum of Algol
	7— 6:— pm	Mercury in perihelion
	10— 9:28 am	Minimum of Algol
	10— 7:14 pm	Conjunction, Mercury and Moon; Mercury north 1° 16'
	11— 6:39 pm	Conjunction, Venus and Moon; Venus north 0° 4'
	12— 8:— am	Mercury greatest elongation east, 18° 20'
	13— 6:17 am	Minimum of Algol

16—	3:06 am	Minimum of Algol
16—	1:55 pm	Conjunction, Mars and Moon; Mars north 6° 36'
18—	12:— am	Mercury greatest heliocentric latitude north
18—	8:— pm	Jupiter stationary in Right Ascension
18—	11:55 pm	Minimum of Algol
19—	5:— am	Mercury stationary in Right Ascension
21—	3:53 am	Conjunction, Uranus and Moon; Uranus north 5° 27'
21—	3:55 am	Sun enters the sign of Aries; Equinox
21—	8:— pm	Venus in ascending node
21—	8:44 pm	Minimum of Algol
24—	—.—	Partial eclipse of the Moon
24—	5:33 pm	Minimum of Algol
26—	8:00 pm	Conjunction, Neptune and Moon; Neptune south 0° 18'
27—	2:22 pm	Minimum of Alogl
27—	11:— pm	Quadrature, Saturn and Sun
28—	12:35 pm	Conjunction, Jupiter and Moon; Jupiter south 2° 56'
29—	5:— am	Inferior conjunction, Mercury and Sun; Mercury north 3° 0'
30—	11:11 am	Minimum of Algol
31—	1:01 am	Conjunction, Saturn and Moon; Saturn south 4° 20'

—*Continued from Page 3*

north of it in summer, and he also sees the great circle which marks the dividing line between day and night, constantly changing its position relative to the equator and the poles. It is easily apparent that in Canada there is a much greater variation in the duration of daylight than in countries nearer the equator.

He learns that on account of the rotation of the earth on its axis a point on the equator travels from west to east at the rate of about 1,000 miles an hour, at 40° latitude at about 800 miles an hour, at 60° latitude at about 500 miles an hour, the rate of travel decreasing to zero at the poles. He can see the lighted half and the dark half of the earth, and the great circle, forming the dividing line between day and night, shifting towards the west as the earth is rotated. Choosing any one point on the globe he sees it move from the dark side across this dividing line into sunlight in the morning, advence through sunlight to be most nearly under the sun at noon, and cross the dividing line at evening into darkness. On the globe our schoolboy sees Canada stretching east and west nearly one-quarter of a complete circuit, so that when the eastern part is crossing the line from darkness into sunlight the western part is still far around in the night. Later on when Nova Scotia has advanced to noon it will be morning in Yukon Territory.

It is an old custom to have clocks set so that noon comes as nearly as possible at 12 o'clock. Obviously then the clocks in eastern Canada must be set several hours ahead of the clocks in western Canada, and similar differences of time occur on all the clocks as one goes from east to west around the earth. The result is that only those places on the same north and south line have the same time. One hundred years ago people got the time for their clocks from the church clock, or the town clock, or sun-dials, or perhaps from a primitive observatory. Each community had its own local time. Later the invention of telegraphy increased communication facilities between the different towns and countries, and the building of railways with their faster means of travel through th different communities made so many different local times exceedingly inconvenient and confusing. For instance, at one time a traveller, in going from Halifax to Toronto, had to change his watch at Saint John, Quebec, Montreal, Ottawa, and Toronto.

Standard Time

In England the very great inconvenience of running railway trains through town after town, separated by only a few miles but each with its own local time, was met by adopting the local time at Greenwich Observatory as the time to be used throughout the whole country. In the United States, since local time in the east was four hours ahead of local time in the west, the use of a single time all across the country would have brought 12 o'clock in some localities several hours before or after noon, and hence the railways divided the country into four regions, which they called Eastern, Central, Mountain, and Pacific, the time used in these zones being five, six, seven, and eight hours, respectively, slower than Greenwich time. The change from one time to another was made at divisional points on the several railways. This time, used by the railways, which went by the name of "railway time", was adopted by most towns in place of their own local time.

From 1878 Sir Sandford Fleming had been advocating the use, throughout the world, of what are called standard time zones. At a world conference held at Washington in 1884, his suggestions were adopted and it was agreed to urge all countries of the world to use standard time zones. This scheme was a compromise between the intolerable confusion of a multitude of local times and the apparently impractical ideal of a single universal time with all clocks marking the same time irrespective of the various local times. Fleming proposed that the number of times in the world should be reduced to twenty-four. Each time zone would extend over one twenty-fourth of the circumference of the earth and would include all the territory between two meridians fifteen degrees apart, each zone being 1,038 miles wide at the equator and narrowing down to nothing at the poles. In each zone the time to be used was to be the local time at the central meridian of the zone. The first, or zero zone, was to be that having Greenwich as the central meridian and comprising that part of the earth between the meridians seven and one-half degrees east and west of Greenwich, respectively. The local time at the Greenwich meridian was to be, then, the standard time of the first zone. Westward from Greenwich the different standard time zones would use the local time at the meridians 15°, 30°, 45° . . . 180° west of Greenwich, and eastward the local time at the meridians 15°, 30°, 45° . . . 180° east of Greenwich. Some of these standard time zones have received generally accepted names, Mid-European and East European having time respectively one hour and two hours greater than Greenwich, while Atlantic, Eastern, Central, Mountain, Pacific, Yukon, and Alaska have times four, five, six, seven, eight, nine, and ten hours, respectively, less than that of Greenwich. The other zones are generally designated by their difference in time from Greenwich.

Almost all large countries of the world have adopted the use of standard times differing by some integral number of hours from the local time at the Greenwich meridian, but many smaller countries and localities use an adopted time differing by other than whole hours. The province of Newfoundland, which includes Labrador, uses time 3 hours 30 minutes less than Greenwich. Many other such examples are seen in the appended list of standard times. In this list the term "standard time" is used to include such adopted times, though these were not included in the twenty-four standard times as originally defined.

In Canada practical difficulties have prevented the eastern and western boundaries of the time zones from being placed exactly on the contemplated meridians. The railways already had arranged for change of time at divisional points. The provinces and territories enacted laws as to what time was to be used within the boundaries of their jurisdiction, and consequently in many cases provincial and territorial boundaries became boundaries of time zones.

XUM

International Date Line

The use of time zones reduced the confusion and inconvenience formerly arising from the use of a multitude of local times and made it fairly easy to answer the very frequent question, "What is the time in one place corresponding to a given time in some other place?" There still remained some uncertainty as to the date at any instant at different points on the earth's surface.

The sailors who first circumnavigated the globe, sailing westward, are reported to have been surprised to find, on arriving again at the starting point, that the date in their log differed by one day from the date kept at their home port. They had "lost" a day. Those who sailed easterly around the globe "gained" a day. In neither case did they gain or lose any time, the days being longer going west and shorter going east. Imagine an aviator setting out from Greenwich at 2 p.m. and travelling westward at a speed of 658 miles per hour, the same as the speed of rotation of the earth's surface at that latitude. The sun would remain in the same direction overhead. The local clocks the aviator saw while passing over North America would all show 2 p.m., though his clock in the plane would show successively 6, 7, 8, 9, and 10 p.m. Continuing on around the world, the flier would find all local-time clocks showing 2 p.m. and would arrive back in London at 2 p.m. Although from his observations of local-time clocks he had appeared to fly around the earth in no time, he would, on his return, find it 2 p.m. of the day after his date of departure—as indeed the clock he carried would prove. Had he set his clock back to local time every time he saw a town clock, he would have "lost" a day as the sailors did.

To avoid complications of this kind, it was agreed to use the meridian of 180° on the other side of the earth from Greenwich as a date line, a place to add the lost day when going west and to subtract the gained day when going east. In order that the date line may not pass through settled lands it is deflected westward around Alaska and eastward to include Chatham Islands and Tonga Islands.

The date is assumed to start when it is midnight at this meridian, then as this midnight point sweeps westward around the earth all that part west of the 180th meridian has the new date, one day later than that east of this "date line" until the midnight point reaches the date line again. Then, for an instant all the earth has the same date, but the next instant the midnight point commences to sweep a new date westward from the date line.

Universal Time Chart

The universal time chart is for the purpose of finding the corresponding times at different places.

For those countries and places whose standard times differ by whole hours from Greenwich time, the chart gives an easy and reliable method of conversion.

At each standard meridian there is a vertical column of figures including all the hours of the day, a.m. and p.m. The outline map of the world superimposed on the chart suggests the standard time used at any place. The horizontal lines show the corresponding times.

Pick out any hour in that vertical column passing nearest to any particular place, follow the horizontal line to the column nearest to any other place required, and the corresponding time is obtained. A change of date occurs at the horizontal line crosses the diagonal line running from the upper right to the lower left corner, the date of those places lying to the right of the diagonal being one day later than that of those to the left.

Examples:

(1) 4^h p.m. July 5 at Ottawa corresponds to
11^h a.m. July 5 at places in Alaska, to
9^h p.m. July 5 at Paris, and to
6^h a.m. July 6 at Tokyo

(2) $3^h\ 15^m$ p.m. Aug. 3 in W. Australia corresponds to
$7^h\ 15^m$ a.m. Aug. 3 at Greenwich and to
$11^h\ 15^m$ p.m. Aug. 2 at Vancouver.

Sunrise and Sunset

The time of sunrise or sunset is defined as the time when the true zenith distance of the sun's centre is 90° 50'. This is the time when the upper edge of the sun's disc appears or disappears on a level plain, allowing 34' for refraction and 16' for the semi-diameter of the sun.

Dusk, Dawn and Twilight

Dawn is usually defined as the time when daylight first appears in the morning sky. Morning twilight is the interval of time between dawn and sunrise. Evening twilight is the interval between sunset and dusk; dusk being defined as the last appearance of daylight in the evening sky.

The illumination of the sky during twilight is due to the rays of the sun which strike the upper layers of the earth's atmosphere; the duration of twilight is hence due to the rate at which the sun sinks below the horizon.

Three intervals of twilight are recognized. Civil twilight is the interval between sunrise or sunset and the times when the centre of the sun is 6° below the horizon. It is that interval during which ordinary outdoor operations are possible with natural illumination, and beyond which artificial light may be required. The brightest stars are still visible at the beginning of morning civil twilight and have made their appearance by the end of evening civil twilight. The amount of illumination available on a particular day during civil twilight is largely dependent on the local topography and the weather.

Nautical twilight is the interval between sunrise or sunset and the time that the centre of the sun is 12° below the horizon.

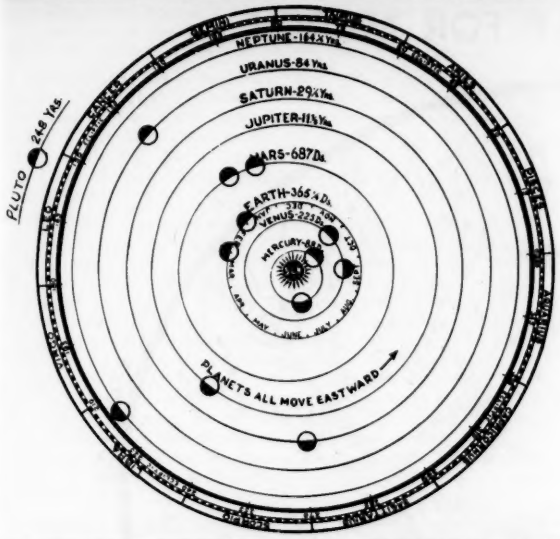
Astronomical twilight is the interval between sunrise or sunset and the time that the centre of the sun is 18° below the horizon.

Dominion Legislation

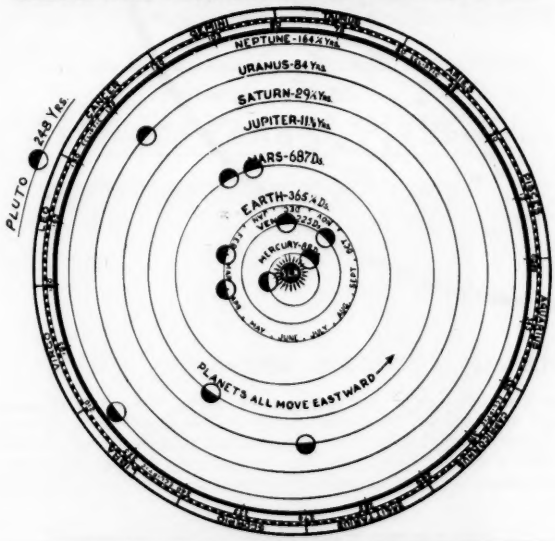
It is one thing to decree that such a thing shall be done at 6 o'clock eastern standard time, but quite another to decide just when 6 o'clock occurs. By Order-in-Council P.C. 6784, August 28, 1941, the Dominion Observatory time was declared the time to be used for official purposes in Canada. For many years prior to this the Observatory had served unofficially as a source of accurate time for a variety of purposes. Observatory time is made available continuously to the Canadian Broadcasting Corporation, and is broadcast daily by a network of stations for about half a minute at 1:00 p.m. eastern time. It is also made available to the two telegraph companies and to the Bell Telephone Company. A 24-hour service is provided, together with a voice announcement each minute, via CHU, which operates on frequencies of 3330 kc., 7335 kc. and 14670 kc.

—Courtesy of the Royal Astronomical Society of Canada

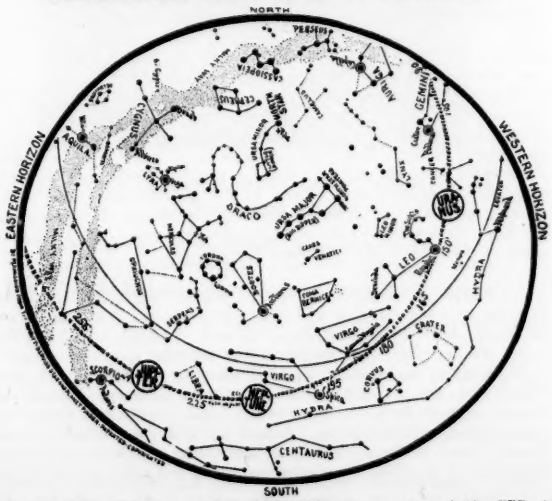
HELIOCENTRIC POSITIONS OF THE PLANETS, FEBRUARY



HELIOCENTRIC POSITIONS OF THE PLANETS, MARCH



MORNING MAP FOR FEBRUARY



At 5:00 A.M., Feb. 1; 4:00 A.M., FEB. 15; 3:00 A.M.; FEB: 28

SATELLITES OF JUPITER

FEBRUARY

Day	West	East
1	2·	1· ·3 ·4
2	·1	3· ·4 ·2●
3	1· 2· ·4	
4	3· 2·	4· ·1●
5	·3 ·2 1·	4·
6	·3	·1 ·2 4·
7	1·	3 4
8	2· 4·	·1 ·3
9	4· ·1	3· ·2●
10	4·	1· 2·
11	4· 3· 2· 1	
12	1· ·4 3· ·2	
13	·4 ·3	·1 ·2
14	·4 1·	3 2·
15	2· 4	·1 ·3
16	·1 ·2	4 3·
17		1 3 2 4
18	2· 3· ·1	·4
19	3· ·2 1	·4
20	·3	·2 ·4 ·1●
21	1· 3	2· 4·
22	2·	·1 ·3 4·
23	1· ·2	4· 3·
24	4· 1· 3 2	
25	4· 3 1 2	
26	4·3· ·2	1·
27	4· ·3	·2 ·1●
28	4·	3 1 2·

Appearance of Jupiter and its satellites at 5:45 A. M., E. S. T. as seen in an inverting telescope

SATELLITES OF JUPITER

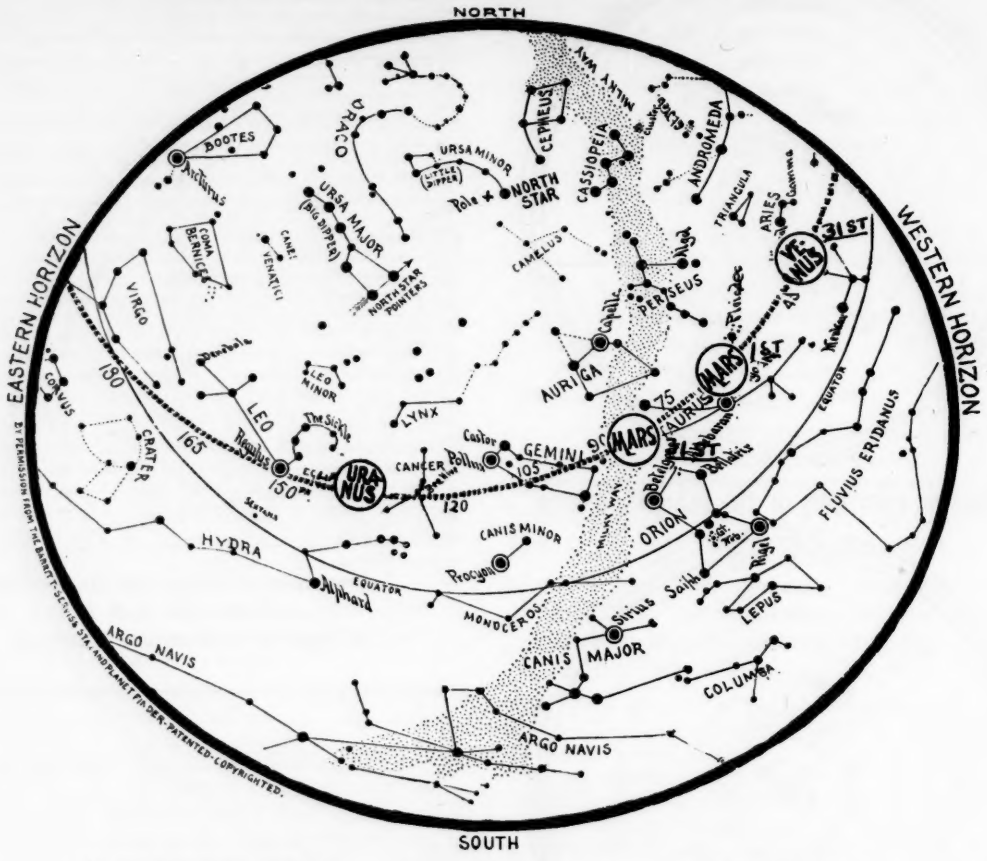
MARCH

Day	West	East
1	·4	2· ·1 ·3
2	·4	2 1 ·3
3	·4	·1 2 3
4	4 1 3 2·	
5	3· 2·	4 1
6	·3	·1 ·4 ·2●
7	·3 1	2· ·4
8	2·	1 ·3 ·4
9	·2 1·	·3 4·
10		1 2 3· 4·
11	1· 3	2· 4·
12	3· 2·	1· 4·
13	·3	·1 4 ·2●
14	4 3	1· ·2
15	4· 2	·3 ·1●
16	4· ·2	1 ·3
17	4·	1 2 3·
18	·4 1·	3· 2·
19	·4 3·2·	·1
20	3· ·4 1 2	
21	·3 ·4	1· ·2
22	2·	·1·3·4
23	1· ·2	3 4
24		1 2 3· ·4
25	1·	3· 2· 4
26	3 2	·1 4·
27	3· 1 2	4·
28	·3	1· ·2 4·
29	1 2	3 4·
30	·2 4 1	·3
31	4·	1 2 3·

Appeaance of Jupiter and its satellites at 4:15 A. M., E. S. T. as seen in an inverting telescope

XUM

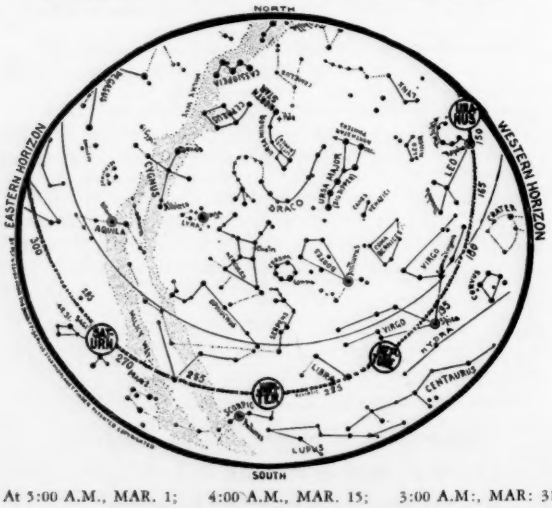
EVENING SKY MAP FOR MARCH



AT 9:00 P.M., MAR. 1 **8:00 P.M., MAR. 15** **7:00 P.M., MAR: 31**

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper. This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitudes in Europe.

MORNING SKY MAP FOR MARCH



At 5:00 A.M., MAR. 1; 4:00 A.M., MAR. 15; 3:00 A.M:, MAR: 31

URANUS AND THE ASTEROIDS

The first few months of the year are very interesting to those observers who want to try their skill and patience at locating objects either just visible or just invisible to the naked eys. Uranus, magnitude 5.7, can be seen without optical help if the night is clear and moonless. The asteroids are not visible without optical aid, with the exception of Vesta, which occasionally reaches magnitude 6 or a little brighter. Of the thousands of asteroids, the first discovered, Ceres, is the largest and among the brightest. Pallas, Juno, and Vesta, the next discovered, are also large and relatively bright. After them, the asteroids scale down to tiny fragments, most of them extremely faint and only visible in the greatest telescopes or by photography. On the January Mercator Projection of the heavens we have shown the paths of two asteroids, and a more detailed chart of the area in which Uranus is moving.

CERES: at the beginning of the period, magnitude is 8. Opposition occurs in May, at which time magnitude is 7.4, easy to see in small telescopes or binoculars. Its path, through Libra, is indicated. The numbers 1, 2 and 3 on the plotting show the position of the asteroid on the 1st day of January (1), February (2), and March (3). On the morning of the 27th of January, Ceres is extremely close to Beta Librae; between 1 and 2 o'clock in the morning, it passes almost exactly 1 minute (1/30th the diameter of the Moon) south of Beta. This is an interesting opposition of Ceres, inasmuch as in 1936 the writer computed positions of Ceres for

January of that year, from elements of the asteroid's orbit given in Russel, Dugan and Stewart's "Astronomy", and saw his first asteroid. It was almost exactly in the same location, in Libra, as this year. To the writer it seems that history, truly, has repeated.

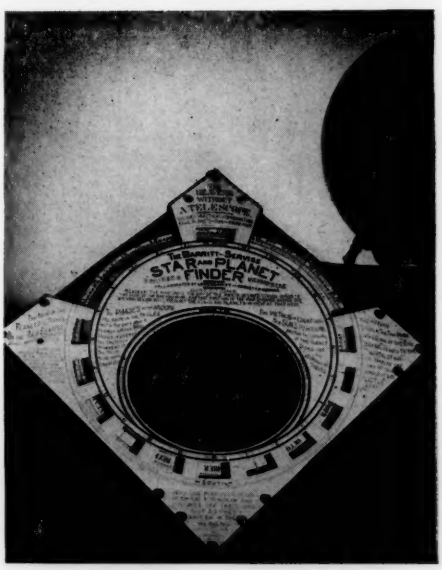
PALLAS: varying in brightness from 7.9 magnitude in January to about 7.5 in April, describes an interesting path from Virgo to Bootes, and on into Coma. Again, the numbered positions on the Mercator Chart correspond to the 1st day of January, February, March, April, and May. Another asteroid, Juno, is very close (1/3°) south) on the 12th, but this is a poor opposition for Juno, and its magnitude is 10.

URANUS: this great and remote planet can be seen with ease in binoculars, but is difficult to identify with certainty because of the many similar-appearing stars in the neighborhood. Toward the right hand corner of the Mercator Projection for January we show an enlarged plotting of the area in which Uranus is moving. The line and four dots close to the center of the plotting represents Uranus' path, with the dots representing the position of the planet on the 1st day of January, February, March and April. Note that the planet, during this period, is retrograding, that is, moving westward. In January, Uranus commences the month in a triangle of stars, with 83 Cancri to the northeast, and Pi Cancri and 81 Cancri to the south. These have reproduced poorly on our chart, but are at least partly legible. These stars are around the same brightness as Uranus; 83 Cancri is magnitude 6.6, 81 Cancri magnitude 6.4, and Pi Cancri is 5.6. The computed magnitude of the planet is 5.7.

We hope the brief directions given above will whet your appetites enough to cause you to venture forth, binoculars in hand, to locate the asteroids and Uranus. Remember, all asteroids and planets move, so that any suspected object will reveal its true nature after a few days, as it shifts its position with relation to the background of stars.

THE BARRITT-SERVISS

STAR and PLANET FINDER



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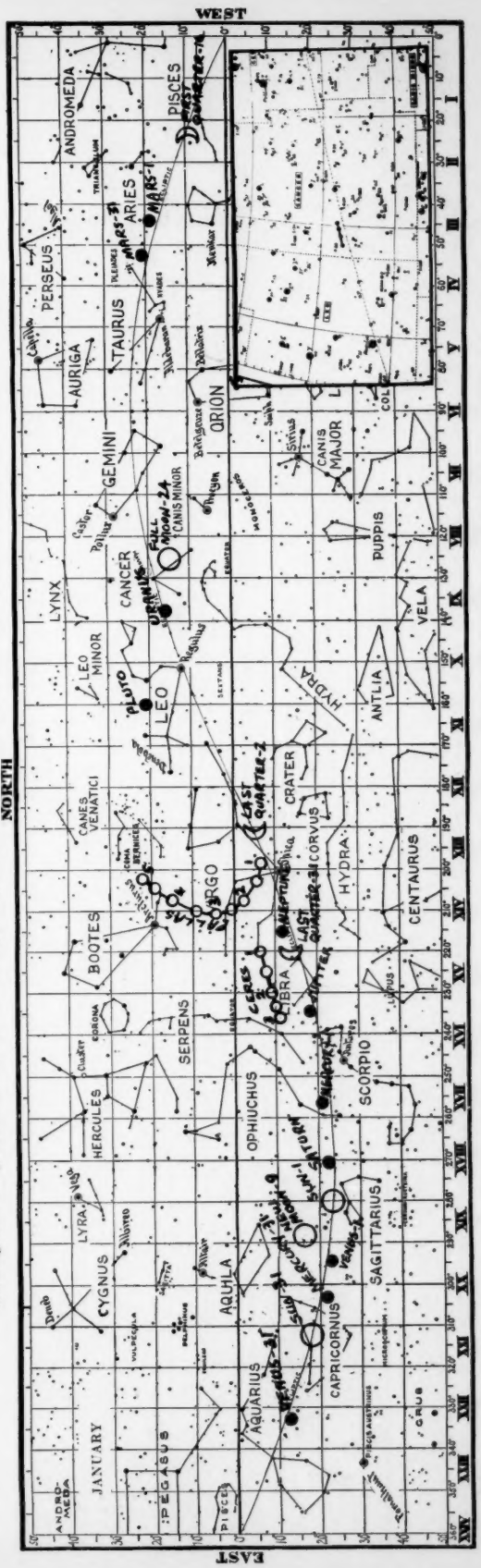
A MERCATOR PROJECTION OF THE STAR FIELD FOR 50° NORTH AND 50° SOUTH OF THE EQUATOR

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is in view. Practical as a Star, Constellation and Planet Finder for the month indicated. Anywhere in the world.
Showing also the position of the Sun at the beginning and ending of the month and the position of the Moon at its several phases.



XUM

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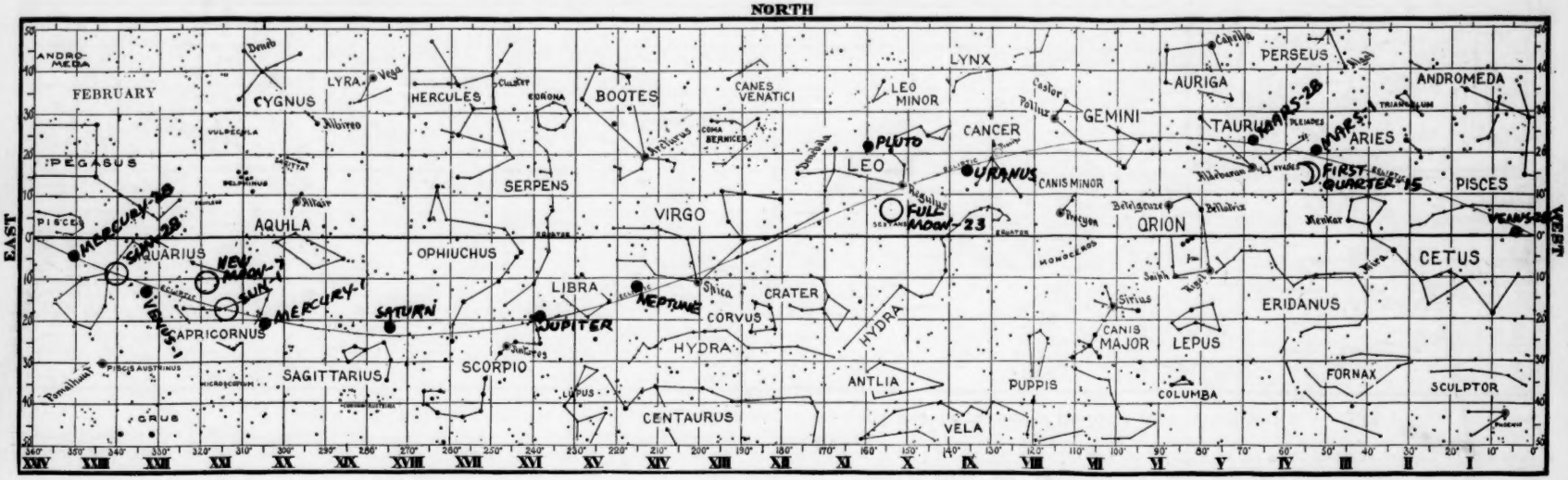
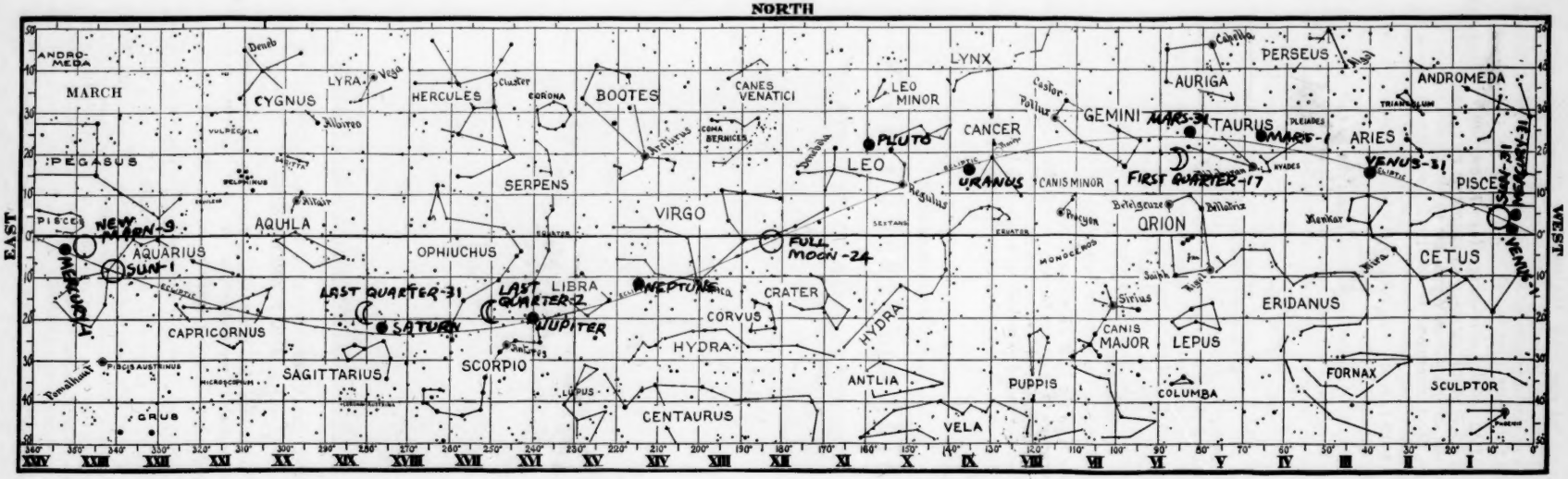
NORTH



NORTH



Nov. 5 Oct. 22 Oct. 5 Sept. 20 Sept. 5 Aug. 20 Aug. 5 July 20 July 5 June 20 June 5 May 20 May 5 Apr. 20 Apr. 5 Mar. 20 Mar. 5 Feb. 18 Feb. 2 Jan. 20 Jan. 5 Dec. 20 Dec. 5 **Nov. 20**

THE DATE BELOW EACH NUMERAL WILL SHOW WHEN THAT SECTION OF THE MAP WILL BE ON THE MERIDAN—DUE SOUTH—AT 9 P.M. OR AN HOUR EARLIER FOR EACH NUMERAL WEST OF THIS DATE AND AN HOUR LATER FOR EACH NUMERAL EAST.